SDMS US EPA Region V

Imagery Insert Form

Document ID: 167692

Some images in this document may be illegible or unavailable in SDMS. Please see reason(s) indicated below:

[X] Illegible due to bad source documents. Image(s) in SDMS is equivalent to hard copy.

Specify Type of Document(s) / Comments:

WELL LOCATION MAP (LAST PAGE)

[ ] Includes _____ COLOR or _____ RESOLUTION variations.
Unless otherwise noted, these pages are available in monochrome. The source document page(s) is more legible than the images. The original document is available for viewing at the Superfund Records Center.

Specify Type of Document(s) / Comments:

[ ] Confidential Business Information (CBI).
This document contains highly sensitive information. Due to confidentiality, materials with such information are not available in SDMS. You may contact the EPA Superfund Records Manager if you wish to view this document.

Specify Type of Document(s) / Comments:

[ ] Unscannable Material:
Oversized _____ or _____ Format.
Due to certain scanning equipment capability limitations, the document page(s) is not available in SDMS. The original document is available for viewing at the Superfund Records center.

Specify Type of Document(s) / Comments:

[ ] Document is available at the EPA Region 5 Records Center.

Specify Type of Document(s) / Comments:

Rev. 07/10/02

167692

Five-Year Review Report

First Five-Year Review Report
for
Pagel's Pit Superfund Site
Rockford, Winnebago County, Illinois

September 2002

Prepared by:
United States Environmental Protection Agency
Region 5
Chicago, Illinois

Approved by:

Wm. E. Muno

William Muno
Director, Superfund Division
U.S. EPA, Region 5

Date:

9/27/02

Table of Contents

Executive Summary

The remedy for the Pagel's Pit Superfund site in Rockford, Winnebago County, Illinois included: a sanitary landfill cover for the waste disposal area; leachate extraction and transfer of the leachate to the local publicly owned treatment works for treatment; gas extraction and the use of the gas for fuel or the flaring of the gas; monitored natural attenuation with a contingency for the groundwater downgradient of the site, the contingency--an active addressing of the groundwater that would prevent the movement of the contamination downgradient and/or remove contamination in the contaminated groundwater downgradient of the landfill wastes, whichever is needed--to be used if the control of the contamination coming from the landfill wastes, the control of contamination coming from upgradient of the site, and the natural attenuation processes do not lead to the eventual return of downgradient groundwater to beneficial use or do not appear to be doing so or the contaminated groundwater becomes an immediate threat to a downgradient water supply; deed restrictions that protect the source control measures through restrictions on construction and that prevent contact with contaminated groundwater through well installation restrictions in those areas containing contaminated groundwater, including areas west of Killbuck Creek; and site monitoring, including monitoring of the groundwater in the southeast corner, and maintenance of all remedial action components. The site achieved construction completion with the signing of the second Record of Decision on September 30, 1999, which acknowledged that the U.S. Environmental Protection Agency's response at the site was complete. The construction of the cover was completed with the acceptance by the State of the construction quality assurance report for the eastern portion in May 2002. The trigger for this five-year review was the acceptance of the remedial design for the western portion of the cover on August 8, 1997.

The assessment of this five-year review found that the remedy was constructed in accordance with the two Records of Decision (RODs). The remedy is functioning as anticipated. Because the remedial actions are protective, the remedy at the site is protective of human health and the environment in the short-term but it is not protective at this time in the long-term because the additional institutional controls specified by the second ROD have not yet been implemented.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name (from *Wasteland*): Pagel's Pit		
EPA ID (from *Wasteland*): ILD980606685		
Region: 5	State: IL	City/County: Rockford/Winnebago County
SITE STATUS		
NPL status: x Final _ Deleted _ Other (specify) _____		
Remediation status (choose all that apply): _ Under construction x Operating _ Complete		
Multiple OUs?* x Yes _ No	Construction completion date: 9/30/99	
Has site been put into reuse? _ Yes x No		
REVIEW STATUS		
Lead Agency: x EPA _ State _ Tribe _ Other Federal Agency _____		
Author name: Bernard J. Schorle		
Author title: Remedial Project Manager (RPM)	Author affiliation: USEPA, Region 5	
Review period:** 7/1/02 to 9/13/02		
Date(s) of site inspection: 7/18/02		
Type of review: x Post-SARA ___ Non-NPL remedial action site ___ Regional discretion		___ Pre-SARA ___ NPL State/Tribe-lead ___ NPL-removal only
Review number: x 1 (first) _ 2 (second) _ 3 (third) _ Other (specify) _____		
Triggering action: _ Actual RA on-site construction at OU # ___ _ Construction completion _ Other (specify) _____		x Actual RA start at OU # 1 _ Previous five-year review report
Triggering action date (from *Wasteland*): 8/8/97		Due date: 8/8/02

*--"OU" refers to operable unit
**--Review period should correspond to the actual start and end dates of the five-year review in *Wasteland*

Issues:
- The institutional controls added with the 1999 ROD have not yet been implemented.
- Landfill gas has not been brought under the control desired at the waste boundary.
- Evaluation of the groundwater contamination results is an ongoing project that is necessary in order to evaluate the progress of natural attenuation for the restoration of the groundwater to a beneficial use.
- Small areas of the landfill cover require some work (proper vegetation and water runoff repair) to protect the integrity of the cover.
- The desired leachate levels in the landfill have not yet been achieved.

Recommendations and Follow-up Actions:
- The additional institutional controls (groundwater use restrictions) have to be enacted.
- The migration of landfill gas from the waste disposal area must be brought under control, which is expected to be accomplished with the installation of the larger flare system.
- The evaluation of natural attenuation will be continued to determine that progress toward restoration of groundwater is occurring.
- Maintenance and repair of the cover needs to be carried out to revamp the damaged parts and improve the vegetation.
- The leachate levels must be brought to the lowest levels possible in order to minimize the amount of leachate passing through the bottom of the landfill.

Protectiveness Statement(s):
The remedy is protective of human health and the environment in the short term. Exposure pathways that could result in unacceptable risks are being controlled and monitored. The remedy is not protective of human health and the environment in the long term since not all of the institutional controls that are needed to prevent exposure to, or ingestion of, contaminated groundwater have been implemented. Threats at the site have been addressed through capping, operation of landfill gas and leachate extraction equipment, maintenance of the site, and monitoring of the groundwater and surface water.

Long-term protectiveness of the remedial action will be possible once the institutional controls are fully implemented and will be verified by continuing to monitor the groundwater. Current monitoring data indicate that the remedy is functioning as required to achieve the clean-up goals.

Pagel's Pit Superfund Site
Rockford, Winnebago County, Illinois
First Five-Year Review Report

I. Introduction

The purpose of the five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in a five-year review report. In addition, the five-year review report identifies issues found during the review, if any, and identifies recommendations to address them.

The Agency is preparing this five-year review report pursuant to Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Part 300). CERCLA §121 states:

> If the president selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section 104 or 106, the President shall take or require such action. The president shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

The Agency interpreted this requirement further in the NCP; 40 CFR §300.430(f)(4)(ii) states:

> If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

Region 5 of the United States Environmental Protection Agency (USEPA), which is the lead agency for the site, has conducted the five-year review of the remedy implemented at the Pagel's Pit Superfund site (the Northern Unit of the Winnebago Reclamation landfill) near Rockford, Illinois. This review was conducted for the entire site by the remedial project manager (RPM) through September 2002. This report documents the results of the review.

This is the first five-year review for the Pagel's Pit site. The triggering action for this statutory review is the reported initiation of the remedial action on August 8, 1997; this was the date for the formal acceptance of the design for the closure of part of the landfill. The five year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use or unrestricted exposure.

II. Site Chronology

Event	Date
Landfill began operation	about 1972
Discovered landfill gas escaping from the landfill and began gas extraction	approximately 1980
Fund-lead remedial investigation (RI) and feasibility study (FS) began	10/1/84
Site proposed for the National Priority List (NPL)	10/15/84
Placed as final on the NPL	6/10/86
Administrative Order by Consent for the RI and FS	8/27/86 effective 10/16/86
Potentially responsible parties (PRPs) take over the RI and FS	8/27/86
Reports for the RI and FS submitted	March 1991
Proposed Plan for Operable Unit (OU) 1 released	4/16/91
Public meeting to discuss Proposed Plan and RI and FS reports	4/25/91
End of public comment period for the Proposed Plan for OU 1	5/16/02
Record of Decision (ROD) for OU 1	6/28/91
Consent Decree for OU 1 remedial design (RD) and remedial action (RA)	lodged 11/25/92 entered 2/11/93
RD began	12/14/92
On-site mobilization for RA began (closure of western portion of landfill)	7/14/97
RA began	8/8/97
Construction quality assurance report for western portion submitted to State	2/23/98
Western portion construction quality assurance report accepted by the State	6/18/98
Proposed Plan for OU 2 remedy and OU 1 remedy amendment released	about 8/13/99
Public meeting to discuss OU 2 proposed remedy and OU 1 proposed remedy change	8/25/99
Informal public meeting to expand on the discussion that began at 8/25/99 meeting	9/8/99
End of public comment period for the 1999 Proposed Plan	9/11/99
Record of Decision for OU 2 remedy and OU 1 remedy amendment	9/30/99
Construction completion under CERCLA	9/30/99
Closure of eastern portion of landfill began	August 2000
Construction quality assurance report for eastern portion submitted to State	September 2001
Eastern portion construction quality assurance report accepted by the State	May 2002
Site inspection for the first five-year review	7/18/02

III. Background

Physical Characteristics

The Pagel's Pit site (Winnebago Reclamation Landfill or WRL) occupies about 100 acres on the west side of Lindenwood Road, south of Baxter Road, about 5 miles south of Rockford, Illinois. The solid waste landfill part of the Superfund site, which is now called the Northern Unit, began operation in about 1972 and ceased accepting solid wastes in 2000 when it reached its permitted capacity; it encompasses about 42.7 acres. The operator of this landfill has obtained permission for a new landfill from the State, located south of the Northern Unit, which is called the Southern Unit, and this new unit is now accepting wastes; it will encompass about 27.5 acres. These two separate disposal units are authorized under a single operating and development permit, Permit

No. 1991-138-LF. The Southern Unit, however, is not part of the Superfund site. These two units, the groundwater monitoring wells, and some other features near the site are shown in Figure 1. (It is to be noted that the designations for some of the monitoring wells have changed over the years.) Municipal refuse and sewage treatment plant sludge have been the primary wastes accepted at the site. Non-hazardous Illinois special wastes (defined in 35 Illinois Administrative Code (IAC) Part 810 as industrial process wastes, pollution control wastes, or hazardous wastes, except as determined pursuant to section 22.9 of the Illinois Environmental Protection Act (415 ILCS 5) and 35 IAC 808) have also been disposed of at the facility.

Land and Resource Uses

The site is located in a predominately rural unincorporated area. It is bounded on the west by Killbuck (or Kilbuck) Creek and on the east by Lindenwood Road. However, the contaminated groundwater has moved to the west side of Killbuck Creek, thus moving the boundaries of the site beyond the 100 acres mentioned above. Killbuck Creek, a perennial stream, merges with the Kishwaukee River about 2.5 miles northwest of the site. The Kishwaukee River merges with the Rock River about 1.5 miles northwest of the confluence of Killbuck Creek and the Kishwaukee River. The site is located on a topographic high between Killbuck Creek to the west and unnamed intermittent streams to the north and the south. Land use around the site is a mix of agricultural, rural residential, commercial, and industrial.

The Northern Unit is located at a former sand and gravel quarry. It has been sequentially constructed and filled in several sections. Development has generally occurred in an east to west direction, first in the southern half and then in the northern half as filling proceeded westward, but the western portion was the first part to be brought to the final permitted height. The landfill liner was constructed by grading and compacting the base and side walls of the landfill. Asphaltic concrete was installed over the sides and floor and compacted, resulting in a minimum two-inch thick layer. The surface of the asphalt was sealed with a cationic coal tar sealer. This sealed asphalt liner was covered with eight inches of sand. A network of perforated pipes was installed in the sand on the sloping base. The pipes were connected to manholes where the liquid that drains from the wastes (leachate) collected. However, most of this original leachate collection system no longer functions. Presently, leachate is pumped from the landfill gas extraction wells to a tank on the landfill's property. From there it is pumped through a force main to a sewer connected to the wastewater treatment plant in Rockford. Landfill gas is collected and is presently being flared. This system for landfill gas extraction has been developed over the years, since the discovery in about 1980 that landfill gas was leaking from the waste disposal area.

The Acme Solvent Reclaiming, Inc. site (Acme Solvent site) is located east of the Pagel's Pit site and it is shown in Figure 1. The Acme Solvent site was proposed for USEPA's National Priorities List (NPL) in December 1982 and was placed on this list in September 1983. Part of the remediation of this site has resulted in the installation of a pump-and-treat system approximately half-way between the two sites. The purpose of this system is to prevent or minimize the movement of contaminated groundwater from the Acme Solvent site toward the west and southwest. The treated water is discharged into the intermittent stream that passes across the Acme Solvent site and lies north of the Pagel's Pit site, but generally the water infiltrates the ground before it reaches Killbuck Creek.

Initial Responses

The Pagel's Pit site was proposed for inclusion on the NPL in October 1984 because the nearby groundwater was found to be contaminated with arsenic, cadmium, and bis(2-ethylhexyl) phthalate. The site was added to the NPL in June 1986.

The USEPA and a few of the potentially responsible parties (PRPs) for this site reached an agreement embodied in an Administrative Order by Consent, with an effective date of October 16, 1986, that required the Respondents to the Order to conduct a remedial investigation (RI) and a feasibility study (FS) at the site. Portions of these studies were carried out by Warzyn Inc., and the reports for the remedial investigation and the feasibility study were submitted in March 1991. Additional investigations were later carried out under this AOC and a 1993 Consent Decree.

A Proposed Plan for Operable Unit (OU) 1 was released to the public on April 16, 1991. This Proposed Plan presented a number of alternatives as possible remedies for the problems that had been identified at the Pagel's Pit site. The Proposed Plan also included a description of the remedy preferred by USEPA and the Illinois Environmental Protection Agency (IEPA). The Record of Decision (ROD) for OU 1, in which the remedy selected for the site was described, was signed June 28, 1991.

OU 1 consists of the wastes that have been disposed of at the site and the contaminated groundwater around the waste disposal area and downgradient as far as the plume of contamination extends, but not the contaminated groundwater in the southeast corner of the site. This groundwater in the southeast corner of the site is designated as OU 2.

A Consent Decree, entered on February 11, 1993, requires several of the PRPs to perform the remedial design (RD), remedial action (RA), and operation and maintenance for the remedy selected in the 1991 ROD. This Consent Decree requires the site operator to perform the remedial work and to pay USEPA for some of its past costs. It requires the other PRPs to pay USEPA for some of its past costs and to contribute to a trust fund that was to be used to help pay for the remedial design and the remedial action.

A Proposed Plan for the remedy for OU 2 and for a change in the remedy for OU 1 was released to the public in August 1999. This Proposed Plan also informed the public of the dates for the comment period (August 13, 1999 through September 11, 1999) and the public meeting (August 25, 1999). At the request of some attendees at the August 25, 1999 public meeting, a second meeting was held September 8, 1999 to further discuss the Proposed Plan. The ROD for OU 2, which also served as a ROD Amendment for OU 1, was signed September 30, 1999.

An amendment to the 1993 Consent Decree will be negotiated to cover the changes made by the remedy selections described in the 1999 ROD.

Extent of Contamination

The topography surrounding the landfill area is generally relatively flat to gently rolling. The landfill lies outside the 100-year floodplain of Killbuck Creek and is not within any designated

wetland area. A small wetland area was identified near the waste disposal area but has since been moved.

The surficial unconsolidated deposits in the area of the site are predominantly glacial drift ranging from a thin mantle over the dolomite in the bedrock uplands to the east of the site to greater than 70 feet in the bedrock valley west of the site. The unconsolidated deposits are predominantly sand and gravel underneath and north of the site with a silty clay to the south of the site. The underlying bedrock surface is highly variable. The dolomite bedrock is generally fractured but the intensity is variable. Chert layers or nodules were commonly noted on boring logs as were vugs (void spaces), but cavernous zones were not reported.

Based on the data from the remedial investigation, the water table occurs in the fractured dolomite bedrock east of and below approximately the eastern quarter of the Pagel's Pit site. Under the remainder of the site and west of the site, the water table occurs in the unconsolidated materials. The overall direction of groundwater flow in the area of the two sites is from east to west in the upper aquifer. However, at the Acme Solvent site and along the southern edge of the waste disposal area of the Northern Unit, the flow was to the west-southwest, with the direction being more southerly at the Acme Solvent site. Along the northern edge of the waste disposal area the flow was toward the west-northwest.

Regular monitoring of the groundwater and the leachate at the site is conducted pursuant to the 1991 ROD and the operating permit that has been issued by IEPA for the landfill. This has resulted in the installation of additional monitoring wells and the acquisition of further data on the groundwater and the leachate since the remedial investigation.

Chloride ion serves as an indicator of groundwater that may have been affected by leachate from a landfill. Chloride ion is generally recognized as a conservative, non-reactive parameter in groundwater systems. Based on the April 1998 groundwater data, the area containing elevated chloride ion concentrations extended from about midway along the north border of the landfill (east of well G15S (B15R)[1]), around the western end of the landfill, and along the south border of the landfill to at least the southwest area (well R42S (G115)). This is the area that may have been affected by leachate from the landfill. Generally, the affected area was relatively close to the waste boundary (within 100 to 200 feet), but a well on the other side of Killbuck Creek (well G34S) also had an elevated chloride ion concentration. Other wells west of the creek sometimes had elevated chloride ion concentrations in 1998 and before, particularly well G35D. Data from the second quarter of 2002 shows a pattern similar to that in 1998 and before.

Applicable groundwater quality standards (AGQSs) have been established for substances that may be present at the Pagel's Pit site. The AGQS established for any constituent is the background concentration or an Illinois Pollution Control Board established standard. (See 35 IAC 811.320 for further information about AGQSs. Part 811 of 35 IAC is entitled "Standards for New Solid Waste Landfills".) As used here, background concentration means the concentration

---

1. The former designation is given in parenthesis. Some wells do not have a former designation.

of a constituent that is established as the background in accordance with the Illinois regulations. Statistical tests and procedures are used in determining the background concentrations. The AGQSs are used in defining a groundwater management zone (GMZ) in the downgradient direction. The GMZ consists of the area where concentrations exceed the AGQSs. The GMZ is a three dimensional region containing groundwater being managed to mitigate impairment caused by the release of contaminants from a site. It is subject to a corrective action process approved by IEPA. (35 IAC 620.250 and 35 IAC 811.324 and 811.325) At this site, the GMZ is defined primarily by the extent of the chloride and ammonia contamination. The AGQS for chloride is 87.5 mg/l and the AGQS for dissolved ammonia-nitrogen is 0.9 mg/l. Roughly, the GMZ includes the area from about the mid-points of the waste disposal area on the north and the south borders toward the west to the vicinity of well nests G16 (G116) and G34.

There is also a zone of attenuation around the waste disposal area within which concentrations of constituents in leachate discharged from the unit may exceed AGQSs. This zone is a volume bounded by a vertical plane at the property boundary or 100 feet from the edge of the unit, whichever is less, extending from the ground surface to the bottom of the uppermost aquifer and excluding the volume occupied by the waste. Once the groundwater concentrations in the GMZ are at or below the AGQSs, there will no longer be a GMZ. However, the zone of attenuation will always exist.

Volatile organic compounds (VOCs) have been found in the shallow aquifer on, and in the vicinity of, both the Pagel's Pit and Acme Solvent sites. VOCs have been found both inside and outside of the area defined by elevated chloride concentrations. During the 1988-90 remedial investigation, the highest concentrations of VOCs were found in wells on or near the Acme Solvent site. The next highest concentrations were found in the southeast corner of the Pagel's Pit site. During this initial remedial investigation a connection between the Acme Solvent site and the southeast corner of the Pagel's Pit site was not definitely shown, possibly because there is fractured bedrock between and in the two areas through which groundwater would move primarily in the fractures. Later, well G20D (G120B) was installed between the two sites, and elevated levels of VOCs were found in water from it. Thus it was shown that at least some of the VOCs present in the southeast corner could have come from the Acme Solvent site. However, it is likely that some of the contamination in the southeast corner has been coming from the landfill. Chlorinated benzenes have been found in this area but were not found in wells closer to the Acme Solvent site.

In the GMZ during 1997 and 1998, tetrachloroethene was the only organic compound whose concentrations exceeded the maximum contaminant levels (MCLs) established under the Federal Safe Drinking Water Act (MCL = 5 µg/l). The MCL for tetrachloroethene was exceeded in wells G16M (G116A), G16D (G116D), and G35S to the west of Killbuck Creek and in wells G41D (G132), G39S (G39), and G03M (P4R) to the east of the creek. The maximum concentration was 12 µg/l, so the AGQS, which is 26 µg/l, was not exceeded. The concentrations of several other organics exceeded their AGQSs in the GMZ, including those of 1,4-dichlorobenzene in four wells. Three of these wells are in or very close to the zone of attenuation and the fourth is directly downgradient of the landfill. In the "background" wells (well G20D (G120B) and 4 of the 5 wells (not including well G14D (G114)) in the southeast corner), the concentrations of several substances exceeded their MCLs: tetrachloroethene in wells G09D (G109A) and G13D

(G113A); trichloroethene in wells G20D (G120B) and G13D (G113A); cis-1,2-dichloroethene in well G13D (G113A); vinyl chloride in well G13D (G113A) (the MCL was also exceeded in well G14D (G114)); and 1,2-dichloropropane in well G13D (G113A). The concentrations of a few other organics exceeded their AGQSs in the southeast corner wells, including 1,2,3-trichlorobenzene, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, and chlorobenzene. These numbers demonstrate the low levels of VOCs generally found in the GMZ. They also show the possible influence of the Acme Solvent site on the groundwater in the southeast corner because of the presence of several chlorinated ethenes. Well G20D (G120B) and the wells in the southeast corner are not part of the GMZ since they are not considered to be downgradient of the waste disposal area. The fact that chlorinated ethenes and chlorinated benzenes were found at higher concentrations in the southeast corner wells than in wells further downgradient demonstrated that natural attenuation processes were taking place.

Killbuck Creek is also regularly monitored by the landfill operator. In 1998, none of the major chlorinated ethenes were detected in the creek, nor were several other VOCs, for which analyses were done. The ammonia concentrations in the creek generally increased between the upstream and downstream sampling points, which may indicate an effect from the landfill. However, the chloride concentrations increased only slightly.

The results of the monitoring of the landfill leachate in the 1997 to 1999 period showed that the chloride and sodium concentrations in the leachate were generally somewhat higher than the ranges for typical landfill leachate. During this period there were no detections of chlorobenzene, 1,4-dichlorobenzene, the two trichlorobenzenes, 1,2-dichloropropane, or any of the major chlorinated ethenes in the leachate.

An investigation for the remedial design of the OU 1 barrier well system found that pumping a well located between the waste disposal area and the creek resulted in a much greater flow rate than had been anticipated when the 1991 ROD was issued. Also, the groundwater downgradient of the landfill was found to contain significant concentrations of ammonia. Ammonia had not been considered in the remedial investigation done for the 1991 ROD. If this groundwater were extracted as part of a system to prevent the movement of the contaminated groundwater downgradient, this ammonia would have to be removed before the treated water could be discharged, unless the concentrations were significantly decreased during pumping because of the introduction into the groundwater of uncontaminated water from the creek flowing to the extraction wells through the ground. Generally, the removal of ammonia would involve raising the pH, stripping the ammonia, and then lowering the pH of the water to an acceptable level for discharge. These results led to the determination that the cost of the barrier well system and associated water treatment system would be much greater than had been estimated for the 1991 ROD, and the Agency agreed to defer implementation of the systems until alternatives could be investigated.

Site Risks

In the 1991 remedial investigation a baseline risk assessment was prepared to characterize the nature and estimate the magnitude of potential risks to public health and the environment. The potential risks were caused by the chemicals of concern and were based on current and possible future land use. The scenario pertaining to potential future groundwater use as a water supply

was found to represent the greatest risk to humans at the Pagel's Pit site. Under this scenario, exposure occurs through groundwater ingestion and from dermal contact and inhalation while bathing. The calculation was done for the groundwater west of Lindenwood Road, including the southeast corner. The calculated cumulative hazard index of 5, not including cobalt exposure (found in only one well), compared to the Superfund goal of 1, indicated that exposure to the noncarcinogens in the groundwater might cause adverse health effects. The majority of the value of the hazard index was due to exposure to the 1,2-dichloroethenes, thallium, and zinc. The calculated cumulative cancer risk of $1x10^{-3}$ exceeded the USEPA target risk range of 10^{-4} to 10^{-6}. The majority of this was due to exposure to vinyl chloride and arsenic.

The total 1,2-dichloroethene concentration (the lesser of the 95% upper-bound confidence limit of the arithmetic mean or the maximum concentration detected) used in the calculation for the risk in 1991 was 240 µg/l. (A risk or hazard quotient (the sum of the hazard quotients for substances that cause a similar effect is the hazard index) is directly proportional to the concentration; if the concentration has decreased, so has the risk or hazard quotient.) In April 1998 there were only five detects of 1,2-dichloroethene (all of the cis isomer) in the groundwater west of Lindenwood Road (31 wells sampled): 98 µg/l in well G13D (G113A) in the southeast corner and concentrations ranging from 6 to 7 µg/l in four downgradient wells. The detection limit was 5 µg/l. The dissolved thallium concentration used for the 1991 risk assessment was 2.8 µg/l (ranging from 2 to 6 µg/l). In April 1998 there were only two detects of total thallium (dissolved thallium was not analyzed for) at about 5.3 µg/l. The detection limit was 5 µg/l. The two thallium detects were in wells from the same general area. No thallium was detected in the leachate in the 1997 through early 1999 period, with detection limits of 1.5, 2.2, and 100 µg/l. The dissolved zinc concentration used for the 1991 risk assessment was 6.3 mg/l (ranging from 0.037 to 6.34 mg/l). In April 1998 there were 25 detects of dissolved zinc in the wells west of Lindenwood Road (31 wells sampled), ranging in concentration to 9.27 mg/l (in well G09D (G109A), in the southeast corner, where the next highest concentration was 1.73 mg/l in well G09M (G109)). The maximum in the downgradient wells was 4.18 mg/l. Hence, all but one of the detects of zinc were below 6.3 mg/l. The detection limit was 0.022 mg/l. The vinyl chloride concentration used for the 1991 risk assessment was 14 µg/l. In April 1998 there was only one detect of vinyl chloride, at 15 µg/l, and this was in a southeast corner well. The detection limit was 2 µg/l. The dissolved arsenic concentration used for the 1991 risk assessment was 8.4 µg/l (ranging from 2 to 46 µg/l). In April 1998 there were 10 detects of dissolved arsenic, ranging in concentration to 25 µg/l, but 8 of the detects were below 8.4 µg/l. The detection limit was 2 µg/l. Thus the concentrations of the substances that were the significant contributors to the risks calculated in 1991 have generally been decreasing or remaining similar to the levels then, but it is clear that risks were still present above USEPA's requirements for remedial action in 1999.

Basis for Taking Action

Because of the unacceptable risk levels revealed by the human health evaluation, a remedy was developed for the site. The primary concerns identified for the 1991 ROD were vinyl chloride and arsenic in the groundwater. Containment of landfill gas was also identified as a problem. Capping the landfill and the other measures taken have been intended to reduce the release of leachate and prevent possible contact with the wastes, contaminated groundwater, and landfill gas.

IV. Remedial Action

Remedy Selected

The remedy that has been selected for the site as a result of the 1991 ROD and the 1999 ROD consists of the following components:

- a sanitary landfill cover for the waste disposal area;
- leachate extraction and transfer to the local publicly owned treatment works for treatment;
- gas extraction and the use of the gas for fuel or the flaring of the gas;
- monitored natural attenuation with a contingency for the groundwater downgradient of the site, the contingency--an active addressing of the groundwater that would prevent the movement of the contamination downgradient and/or remove contamination in the contaminated groundwater downgradient of the landfill wastes, whichever is needed--to be used if the control of the contamination coming from the landfill wastes, the control of contamination coming from upgradient of the site, and the natural attenuation processes do not lead to the eventual return of downgradient groundwater to beneficial use, do not appear to be doing so, or if the contaminated groundwater becomes an immediate threat to a downgradient water supply;
- deed restrictions that protect the source control measures through restrictions on construction and that prevent contact with contaminated groundwater through well installation restrictions in those areas containing contaminated groundwater, including areas west of Killbuck Creek; and
- site monitoring, including monitoring of the groundwater in the southeast corner, and maintenance of all remedial action components.

Remedy Implementation

The final cover has been constructed in two phases. First, the cover was installed on the western portion (approximately 16.6 acres) of the landfill after the wastes had reached the permitted elevation. This work was begun in July 1997. The design for this portion of the landfill was approved on August 8, 1997. *Construction Quality Assurance Acceptance Report Pagel Landfill Final Construction, Western Portion*, February 1998, was submitted to the State on February 23, 1998. The report was accepted by the State on June 18, 1998.

The construction of the final cover for the eastern portion of the landfill was begun in August 2000 after the wastes had reached the permitted elevation in the rest of the landfill. *Construction Quality Assurance Acceptance Report Pagel Landfill Final Cover Construction--Eastern Portion*, September 2001, was submitted in September 2001. Following the submittal of some additional information, the report was accepted by the State in May 2002.

For both portions, the work consisted of the following components:

- a grading layer;
- a 1-foot recompacted clay layer;
- a 40-mil flexible membrane liner;
- a drainage layer;
- a 2.5-foot protective layer;

- a 6-inch topsoil layer with fertilizer, seed, and mulch;
- storm-water terraces, letdowns, ditches, and culverts;
- a leachate extraction (leachate wells and pumps and associated piping) and conveyance system; and
- a gas collection system, including connection to a flare system.

The gas collection and control system (GCCS) includes 35 vertical dual leachate/gas extraction wells, collection piping network, and leachate storage tanks. The collected gas is presently being directed to a flare. There are gas probes located outside the waste boundary which are monitored. The landfill operates under air permit ID #201801AAF and site number 2018080001 issued by IEPA. An application for a Title V--Clean Air Act Permit Program (CAAPP) permit has been submitted and is expected to be issued soon. This permit will combine the previous air permits for the site into one document.

It has been necessary to perform additional work on the leachate extraction system because of problems encountered with the in-well pumps. Consequently, the lowering of the leachate level in the landfill has been slow in being accomplished.

During the construction of the cover for the eastern portion of the Northern Unit, a soil methane vacuum system (SMVS) was installed, in late October and early November 2000, at the east facility boundary to provide protection from exposure to landfill gas migrating from the landfill. Migration was expected to increase because the new cover would cut off the venting through the intermediate cover at the same time the gas extraction wells were not operating because of the construction activities. This extraction system was discussed in a December 2000 significant permit modification application submitted to the State in December 2000. This modification was approved by the State on April 13, 2001 (Modification No. 15). This system, modified slightly, is still being operated. The system consists of four extraction wells connected to a 200 cfm blower which vents the gases to the atmosphere.

There have been continuing problems controlling the landfill gas since the cover construction has been completed. A larger capacity system for handling the landfill gas being extracted from the landfill gas/leachate wells (2500 cfm versus the 1000 cfm system being used at the completion of the capping work) has been installed in September 2002 to provide the required control of the landfill gas migration. In about mid September, the new system became operational and proper balancing was begun. Also, the operator of the landfill has negotiated a letter of intent with an outside company for the installation of a system to use the landfill gas to generate electricity; this system is to use landfill gas from both the Northern and Southern Units.

Additional work is still being done to bring the final cover into full compliance with the State's requirements. Mostly, this involves repairing erosion and fixing areas containing sparse vegetation.

Cost figures for the construction of the final cover are not presently available.

The deed restrictions for the waste disposal area and those areas nearby that were required under the 1991 ROD have been implemented. Still to be implemented are the additional restrictions

that are required by the 1999 ROD. It is expected that these additional restrictions will be imposed when an amendment to the 1993 Consent Decree has been agreed upon.

Construction completion for the site was deemed to have been achieved with the issuance of the 1999 ROD on September 30, 1999, which acknowledged that USEPA's response at the site was complete. All remaining construction activity was to be completed by the operator of the landfill in accordance with the requirements of Operating Permit No. 1991-138-LF issued on August 17, 1999 by the Division of Land Pollution Control, Illinois Environmental Protection Agency. The long-term groundwater monitoring requirements of the 1999 ROD were already specified in the 1993 Consent Decree and were also required under the existing operating permit.

Operation and Maintenance

The landfill's operator provides the operation and maintenance required under the State's regulations for a closed landfill. Mostly this consists of:

- groundwater monitoring;
- cap inspection and maintenance;
- operation and maintenance of the leachate extraction system, including leachate disposal to the local publicly owned treatment works through a force main to the sewer; and
- operation and maintenance of the landfill gas extraction system, which presently includes a flare for the disposal of the gas.

V. Progress Since the Last Five-Year Review

This is the first five-year review.

VI. Five-Year Review Process

Preparation

The IEPA and contacts for the landfill operator were formally notified by letter on July 5, 2002 that the five-year review was to be conducted. However, there had been earlier informal discussions with the IEPA contact and the operator that the review was to be conducted.

The USEPA remedial project manager (RPM) prepared an announcement about the upcoming review that was mailed to approximately 65 parties on July 3, 2002. The mailing list was developed primarily from a record of those who had shown an interest in the site during the public comment period prior to the 1999 ROD. A few additional announcements were mailed later as additional names were added to the mailing list. The announcement told the recipients the location of the repository and a little about the site, and it asked that any comments be submitted with a postmark no later than July 25, 2002.

A few comments have been received, and these will be addressed later in this report. Also, the RPM met informally during the site visit with several nearby residents and the operator of a nearby business, some of whom he had spoken with previously. He also spoke with at least one additional person who later submitted a comment. The RPM and a representative of the landfill

operator were interviewed by a reporter for the local newspaper during the site visit.

A notice will be sent to the parties that were sent the announcement and a few others informing them of the completion of the review and the availability of the report once the report is signed.

Document Review

For this review, the RPM has gone over the periodic reports and other submittals from the operator. The operator provided some additional documents updating the information about the site to help in the review. The two RODs, the Consent Decree, and some of the past documents that have been submitted were reviewed. Some documents for the Acme Solvent site were also consulted.

Data Review

The monitoring program consists of 33 wells and 3 stream gauge locations in Killbuck Creek. The wells are screened in either the upper sand and gravel, the lower sand and gravel, or the bedrock portion of the aquifer. The wells are sampled quarterly for a limited list of parameters and annually for a much more extensive list which includes the organic parameters. The three indicator parameters that are primarily used for defining the plumes and the GMZ are dissolved ammonia, dissolved boron, and dissolved chloride.

In the second quarter 2002 sampling event there were only a few exceedences of the AGQSs for organic parameters in samples from the monitoring wells. These exceedences were in upgradient wells G13D and G20D (cis-1,2-dichloroethene in both cases), in sidegradient (or downgradient) well G14D (1,4-dichlorobenzene, chlorobenzene, benzene, and ethylbenzene) in the southeast corner, and in downgradient well G15S (tetrahydrofuran and 1,4-dichlorobenzene) along the northern border of the waste disposal area. None of the concentrations were above the maximum contaminant levels (MCLs) (tetrahydrofuran has no MCL).

Several inorganic parameters have been exceeding the AGQS values. Typically, ammonia, arsenic, boron, and chloride show exceedences in several wells. The highest concentrations generally occur directly downgradient of the waste disposal area and the concentrations decrease with distance.

In the southeast corner wells and the further upgradient well (G20D), a statistical analysis (Mann-Kendall test) done by a contractor for the landfill operator shows some increases in the three indicator parameters. All three parameters are increasing in well G09D, with two of them considered significantly increasing (dissolved boron and dissolved chloride). These two parameters are also increasing in wells G09M, G13D, and G20D, and dissolved boron is slightly increasing in well G13S. These trends, based on the statistical analysis, will be followed closely to see if they are real and, if they appear to be, what the reason(s) for them may be. (Reportedly, the S statistic that results from this analysis can give a positive value, indicating an increasing trend, even when the concentration is decreasing and a negative value even when the concentration is increasing. In some of the cases here, where there is an indication of an increasing trend, the plots of the data do not seem to indicate a definite increase. In fact, the plots for dissolved boron

in wells G20D, G09M, and G09D appear to show a decreasing concentration.)

The contractor has also performed the Mann-Kendall test for dissolved ammonia, boron, and chloride in the other wells that are being monitored. In a July 2002 draft document assessing the performance of the remedial measures, the contractor's conclusion, based on the results of the statistical analysis, is that ". . .the facility is still affecting the groundwater quality at wells immediately downgradient to the North Unit (R03S and G03M), although concentrations in wells closer to the plume boundaries appear to be decreasing." In wells R03S and G03M, the plots of the three indicator parameters do show increases since the first quarter of 1997 but the plots appear to show the concentrations to be essentially steady since the first quarter of 2001 (through the second quarter of 2002).

It is too soon after the final closure of the landfill to expect definite results from the source control measures taken, especially in light of the problems that have been encountered with getting the leachate levels under control.

Site Inspection

An inspection of the site was conducted on July 18, 2002 by the RPM and a representative of the landfill operator. The purpose of the inspection was to check the site and look over those things that are not generally reported on. Except for some minor items noted, mainly related to the short time since the last of the cover was installed, the site appeared to be in very good condition. There were a few spots where the cover is being repaired or needs repair.

While at the site for the inspection, the RPM visited for an hour or two with a few neighbors that live south and a little east of the site; a couple of them had called the RPM before the site visit. The RPM also met with a business owner who is located east of the site and north of the Acme Solvent site who expressed some of his opinions about the site. The RPM and the landfill representative met with a reporter with the major local newspaper and explained why the five-year review was being done.

Response to Comments

Comments were received from two residents who live about 1/2 mile south-southeast of the landfill, a resident and landowner who lives about 1 1/4 miles east-northeast of the landfill, the manager of a residential park located about 1 mile north-northwest of the landfill, and the owner of a quarry located across the road from the landfill.

The comments from the first four parties primarily dealt with issues associated with a landfill accepting wastes such as odors, claims that equipment with back-up alarms are operating late at night, lack of proper cover in the area of the working face, and litter blown around; some pictures of the litter were submitted. There was a claim that gas was purposely being released at night rather than during the day when there were workers around the landfill. It was claimed that leachate was running out from the cover. In addition, concerns were raised by the two residents south-southeast of the site about their well water and why they were not offered connections to the water supply line that was installed along Lindenwood Road. It was also mentioned that two

residents in the area had died of cancer and a concern was raised about the operator doing its own sampling.

Although there is a claim that complaints reported to IEPA concerning the operations of the landfill are not checked out, IEPA is the proper party to contact when there are concerns about the operation. This five-year review is looking at the adequacy of the remedies that have been selected for the Superfund site and it is not intended to address the ordinary operations of a permitted landfill. The operating landfill's hours for accepting wastes are restricted by its permit; it is not known what vehicles are operating late at night, for the landfill only operates long enough after the gates are closed to apply the cover for the day. There are other operations in the area using vehicles. The litter pictures were identified by the operator's representative as pictures of an event that took place some time ago when there were very high winds, and the area was reportedly cleaned up as quickly as possible. During the site visit, litter and gas odors did not appear to be problems.

There apparently have been some stains seen on the cover placed on the Northern Unit and these have been interpreted as leachate seeping from the cover. The operator's representative said that some compost was used in the topsoil layer of the cover and that this was the source of the stains. The cover contains a flexible membrane that extends down the sides and this will prevent both moisture from entering the landfill and leachate from leaving it through the sides that are above the surrounding ground surface. USEPA will monitor any occurrences of stained areas to ensure that leachate is not seeping from the landfill. Eventually the leachate levels in the landfill will be below the surrounding ground surface, and this will further reduce the likelihood of seeps.

Regarding the concern about possibly contaminated well water to the south-southeast of the landfill and the belief that other residents in the area should be provided access to the water supply line that was installed along Lindenwood Road, it needs to be noted that this line was installed by the PRP Group for the Acme Solvent site. Consequently, those who believe that they should have been offered an opportunity to connect to the line need to contact the Acme Solvent PRP Group. Contaminated groundwater leaving the Pagel's Pit site does not flow to the south or southeast, and that is the reason that residents in that area have not had their water checked by the Pagel's Pit operator. The Winnebago County Health Department is looking at the groundwater data for the area, and the RPM intends to keep in touch with them about this. Reportedly, some of the people south-southeast of the landfill have had their water analyzed over the past few years, sometimes by the State, and nothing that might be attributed to the landfill has been found; there is some contamination in the water that is not unusual in areas containing farms.

Regarding the concern about cancer deaths in the area, it is very difficult to connect cancer directly to environmental exposures, especially in an area that has a small population. Whether there is a connection here will probably never be known. It is to be noted that exposure to groundwater was found to have the greatest estimated risk at the site. Regarding the concern that the operator is doing the monitoring, the Superfund and State landfill programs, like many regulatory programs, allow operators to collect samples and utilize approved laboratories under strict quality assurance programs. In addition, USEPA can split samples with the operator for independent laboratory analysis at any time if there are concerns about the quality of the operator's data.

The quarry owner voiced his concerns about the decisions made with the 1999 ROD and the change in the remedy for the groundwater that was made then. He does not believe the monitoring program is properly designed; in particular, he does not believe the lower part of the sand and gravel aquifer and the bedrock aquifer are being adequately monitored to the west. He does not believe the operator should be doing the monitoring. He claimed that the material for the cover on the Northern Unit was improper, including a claim that "cyanide contaminated soil from Parson's Casket Superfund site in Belvidere" was used as the final cover, and that leachate is discharging into the intermittent streams north and south of the landfill that flow into Killbuck Creek; these releases are claimed to occur at night. He claimed, "EPA has also documented discharge directly into the Kilbuck Creek with the use of portable hoses." This may have been in 1986, but he claims it is still happening. He also claims that there are leachate springs on the east slopes of the landfill. He stated, "As I am sure you are aware, residents along Lindenwood Road were evacuated from their homes this past spring due to high level of landfill gases detected in their basements." He claims that there is or was "surface venting" of gases and he mentioned gas odors. He claimed that there is a ". . .high percentage of cancer and other diseases rampant in the area. . .".

The quarry owner voiced some of these concerns during the public comment period for the 1999 Proposed Plan, and these concerns were addressed in the responsiveness summary for the 1999 ROD; this document should be consulted for responses. Some of his concerns have also been addressed above in the response to the comments made by others.

No proof has been provided that the monitoring program has been improperly designed; USEPA stated in the responsiveness summary that specifics would be necessary in order for us to respond. The program meets the requirements of the State and USEPA and is periodically evaluated to determine if any changes are needed as new data is obtained. The monitoring program does include wells within the lower part of the sand and gravel aquifer and the bedrock aquifer that it was claimed were missed.

The documentation (dated July 1999) for the contaminated soil that was brought from the Parsons Casket Hardware Co. site shows that the analyses indicated there were no problems with the material and it could be placed in the landfill. The February 2002 fact sheet for the Parsons Casket site says that the remedial action for the soil operable unit was completed in August 2000, about the time cover construction for the eastern portion at Pagel's Pit began. Reportedly, compost is an acceptable material for a landfill cover. The construction of the cover for the Northern Unit was observed and documented by a third party Construction Quality Assurance Office whose report was filed with the State, as the regulations require.

There has been no evidence presented that leachate is being discharged into streams that lead to Killbuck Creek, and no leachate "springs" on the cover were seen during the site visit.

No evacuations of homes along Lindenwood Road this past spring because of high levels of landfill gas in basements were reported to USEPA. Based on information from the landfill, no individuals, resident(s), or other people have been evacuated in the previous 10 years because of high levels of landfill gas being detected. The home across the road from the landfill (8554 Lindenwood Road), which had been the occupied residence closest to the landfill, had continuous

monitoring devices with alarms installed in the basement. Buildings on the landfill property and the Rockford Skeet Club building also have continuous monitoring devices. The alarms are set to trigger an audible alert at 20% of the lower explosive limit (LEL) for methane; the LEL for methane is about 5000 ppm by volume and is the minimum concentration needed for an explosion. Also, below-ground gas probes were installed in the front yard of the 8554 residence, between the home and the landfill. On several occasions during the fall of 2001 one or more alarms at the 8554 residence were triggered. However, checks of the basement with a portable methane monitoring device did not show detectable levels of methane within the basement. Subsequent investigation found that the only alarm being triggered was the one located by a covered sump in the basement, in which low levels of methane were detected. Additional investigations did not detect methane in the gas probes in the front yard. It is unknown whether the methane in the sump came from the landfill or from the septic field, which was adjacent to the corner of the house where the sump was located.

The landfill's representative has reported that Winnebago Reclamation Service (WRS) had acquired an option to purchase the 8554 residence in 1990. In the fall of 2001, prior to the alarms being triggered, the owners of the residence approached WRS about purchasing the home at that time, and WRS agreed to do so. The closing on the purchase took place in July 2002, 8 months later; the delay had nothing to do with landfill operations.

A soil methane vacuum system in the southeast corner has been operated to help control the gas problem (see the section on remedy implementation) and the increase in the size of the landfill gas extraction equipment will greatly reduce any problems. The goal of the landfill gas control system is to control the pressures within the waste disposal area and direct the gas to the flare. The operation of the system will be followed closely to determine that it is performing adequately.

VII. Technical Assessment

Question A. Is the remedy functioning as intended by the decision documents?

The review of the available information indicates that the remedy is functioning as it was intended. The early indications are that the contaminant levels near the boundaries of the downgradient plume may be decreasing even at this early date and the concentrations of the three indicator parameters in the wells immediately downgradient of the waste disposal area may be holding steady. It is expected that after the leachate levels are brought to their required low levels the downgradient concentrations will further improve.

USEPA has no information on the costs of operation and maintenance at this time. The activities being conducted by the operator are required by the State under the landfill permit, so it is unlikely that scrutiny of the operation and maintenance costs could show significant savings.

The additional institutional controls required under the 1999 ROD have not yet been put into place. It is expected that this will be done soon after USEPA and the site operator agree on the changes in the 1993 Consent Decree necessary to incorporate the requirements of the 1999 ROD. USEPA expects this to occur in 2003.

Question B. Are the exposure assumptions, toxicity data, clean-up levels, and remedial action objectives used at the time of the remedy selection still valid?

There have been no major changes in the physical conditions of the site that would affect the protectiveness of the remedy. The site is being used as anticipated (that is, the waste disposal area is not being used and no new buildings have been erected or proposed for the areas beside the waste disposal area, but one of the existing buildings has been leased to a different company). Therefore, the exposure assumptions that were made do not need to be changed.

The primary applicable or relevant and appropriate requirements (ARARs) that the site has to meet fall into three general categories of regulations: landfill; air; and groundwater. Because this is a facility permitted by the State, the operator is aware of the requirements that apply. Arsenic is a substance of concern at this site, and its MCL has recently been reduced from 50 µg/l to 10 µg/l. However, the AGQS for dissolved arsenic that the landfill has to meet under the State's landfill regulations is 2 µg/l, so this change should have no effect.

Question C. Has any other information come to light that could call into question the protectiveness of the remedy?

There has been no new information that would suggest that the selected remedy is not protective.

Technical Assessment Summary

According to the data reviewed, the site inspection, and discussions with the operator's representatives, the remedy is functioning as intended by the two RODs. There have been no changes in the physical conditions at the site that would affect the protectiveness of the remedy. The regulations that the operator must be in compliance with are straightforward. The concentrations of the three indicator parameters in the two wells directly downgradient of the waste disposal area have been holding steady; the leachate levels still need to be lowered to the desired elevations and so source control has not been optimized yet. The fact that the concentrations are not yet decreasing does not call into question the protectiveness of the remedy.

VIII. Issues

The issues identified during this review were:

- The institutional controls that were added with the 1999 ROD have not yet been implemented. This does not affect the current protectiveness but it does impact future protectiveness of the remedy.

- Landfill gas has not been brought under the control desired at the waste boundary. This does not affect current protectiveness since no occupied structures are close enough to be impacted by the gas but it does impact future protectiveness of the remedy.

- Evaluation of the groundwater contamination results is an ongoing project that is necessary in order to evaluate the progress of the natural attenuation for the restoration of the

groundwater to a beneficial use. Although strictly not an issue, it is included here as a reminder that it is a very important part of the project. This does not affect the current protectiveness but it does impact future protectiveness of the remedy.

- Small areas of the landfill cover still require some work (proper vegetation and water runoff repair) in order to protect the integrity of the cover. This does not affect the current protectiveness but it does impact future protectiveness of the remedy.

- The desired leachate levels in the landfill have not yet been achieved. This does not affect the current protectiveness but it does impact future protectiveness of the remedy.

IX. Recommendations and Follow-Up Actions

Institutional controls. The additional institutional controls in the form of groundwater use restrictions will have to be enacted. It is expected that this will be done shortly after agreement is reached on some changes in the 1993 Consent Decree. USEPA will oversee the placement of the controls by the land owner(s). It is expected that this will be accomplished during 2003.

Landfill gas. The migration of landfill gas from the waste disposal area must be brought under control. It is expected that this will be accomplished with the installation of the larger flare system for the gas. If this larger flare does not fully fix the problem, then other measures will have to be considered. USEPA will oversee the implementation of this added capacity to the control system by the landfill operator. It is expected that this will be accomplished by December 2002.

Evaluation of natural attenuation. This is an ongoing part of the remedy. The evaluation is necessary not only to determine that adequate progress towards restoration of the groundwater is occurring but also to determine that the monitoring well network is adequate to know the extent of the plume. USEPA will oversee the ongoing evaluation. There is no time estimate at this point for when this may end.

Maintenance of the cover. The cover must contain sufficient vegetation to protect it from wind and rain and the cover must allow proper runoff of water. There are some small areas of the cover that need some repair. USEPA will oversee this work. Since winter is approaching, it is expected that this will be completed by October 2003.

Leachate elevations. The leachate levels must be brought to the lowest levels possible in order to minimize the amount of leachate passing through the bottom of the landfill. It appears that pumps that are adequate for the job have now been obtained. USEPA will oversee this work by the landfill operator. It is expected that the levels will be brought near the final levels within about six months, but it may take one to two years to bring them to the lowest possible points.

X. Protectiveness Statement

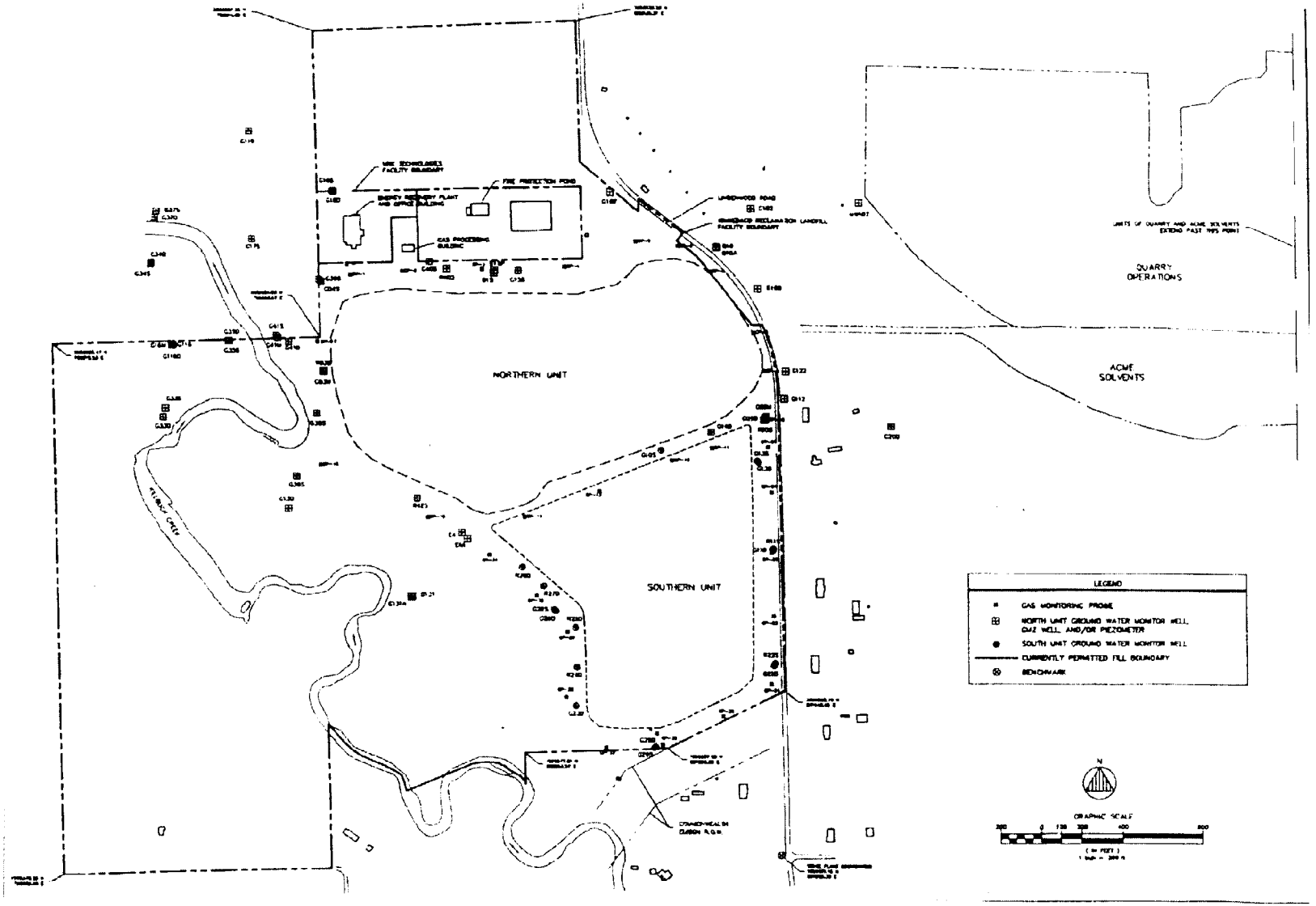
The remedy is protective of human health and the environment in the short term. Exposure pathways that could result in unacceptable risks are being controlled and monitored. The remedy is not protective of human health and the environment in the long term since not all of the institu-

tional controls that are needed to prevent exposure to, or ingestion of, contaminated groundwater have been implemented. Threats at the site have been addressed through capping, operation of landfill gas and leachate extraction equipment, maintenance of the site, and monitoring of the groundwater and surface water.

Long-term protectiveness of the remedial action will be possible once the institutional controls are fully implemented and will be verified by continuing to monitor the groundwater. Current monitoring data indicate that the remedy is functioning as required to achieve the clean-up goals.

XI. Next Review

The next five-year review for the Pagel's Pit site is required in September 2007, five years from the date of this review.



Well Location Map.
(Original from Andrews Environmental Engineering, Inc., dated 12/00, modified 6/01)